

Imaginative fluoropolymer solutions

Attachment P

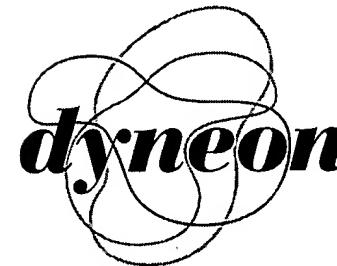
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At Dyneon, our goal is to provide you with design solutions to make your job easier – helping you solve problems now so that you can avoid problems later.

Whatever your challenge, you can count on Dyneon to respond with dependable, high-performance fluoropolymer products. By working directly with our customers and exploring new technologies, you can be sure that our fluoropolymers will not only meet today's needs, but future design requirements as well.

Our worldwide commitment to quality

Indicative of our commitment, all Dyneon design, development, production and service facilities have achieved a global ISO 9001 quality management certification. Additionally, our Decatur, Alabama site and the remote functions in Oakdale, Minnesota have achieved a QS-9000 certification for our quality management system. The Decatur, Alabama and all Germany locations, as well as the production facilities at Antwerp, Belgium have also received ISO 14001 certification for their environmental management system. In addition, our Aston, Pennsylvania PTFE custom compounding facility has A2LA accreditation for its quality control laboratory.



A 3M Company

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The Dyneon Product Portfolio:

Dyneon™
PTFE & Custom Compounds

Dyneon™
PFA, ETFE, FEP, THV, HTE Fluorothermoplastics

Dyneon™
Fluoroelastomers

Dyneon™
Polymer Additives

Dynamar™
Polymer Processing Additives

Dynamar™
Elastomer Additives

Dyneon™
Monomers

Important Notice:

Because conditions of product use are outside Dyneon's control and vary widely, user must evaluate and determine whether a Dyneon product will be suitable for user's intended application before using it. The following is made in lieu of all express and implied warranties (including warranties of merchantability and fitness for a particular purpose): If a Dyneon product is proved to be defective, Dyneon's only obligation, and user's only remedy, will be, at Dyneon's option, to replace the quantity of product shown to be defective when user received it or to refund user's purchase price. In no event will Dyneon be liable for any direct, indirect, special, incidental, or consequential loss or damage, regardless of legal theory, such as breach of warranty or contract, negligence, or strict liability.

Technical information, test data, and advice provided by Dyneon personnel are based on information and tests we believe are reliable and are intended for persons with knowledge and technical skills sufficient to analyze test types and conditions, and to handle and use raw polymers and related compounding ingredients. No license under any Dyneon or third party intellectual rights is granted or implied by virtue of this information.

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Printed in USA. 98-0504-1460-0

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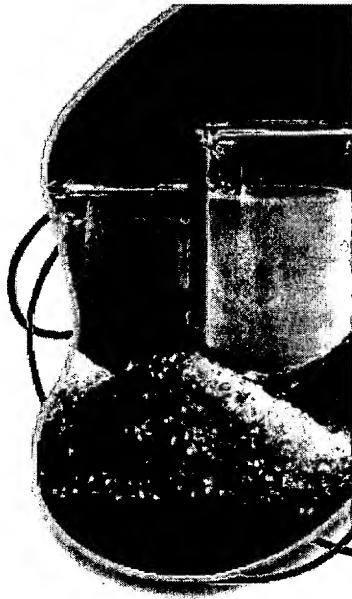
FTP FAQs

Dyneon™ Fluorothermoplastics (FTPs)

1. **Does Dyneon sell plastic parts?**
2. **What type of fluorothermoplastic products does Dyneon offer?**
3. **Are any Dyneon™ Fluorothermoplastic products FDA compliant?**
4. **Does Dyneon offer any Ultra High Purity (UHP) grades of fluorothermoplastics?**
5. **What forms are Dyneon™ Fluorothermoplastics available in?**
6. **Which fluorothermoplastic has the highest temperature and chemical resistance?**
7. **Do any of the Dyneon™ Fluorothermoplastics meet the UL 94 specifications?**
8. **What is the most flexible grade of Dyneon™ THV?**
9. **Why are fluoropolymers used as a barrier in automotive fuel systems to reduce automotive fuel evaporation emissions?**
10. **What is THV and how is it different from other fluoropolymers?**
11. **Can THV be bonded directly to other plastics or elastomers or is an adhesive required?**
12. **Is corrosion protection required when extruding fluorothermoplastics?**
13. **Do fluorothermoplastic resins need to be dried prior to processing?**
14. **What are typical melting temperatures for Dyneon Fluorothermoplastics?**

1. Does Dyneon sell plastic parts?

No, Dyneon is a fluoropolymer (raw material) supplier. We manufacture fluorothermoplastics for our customers to convert to final products such as injection molded goods, extruded films and tubing, and coatings.



[\(Return to Top of Page\)](#)**2. What type of fluorothermoplastic products does Dyneon offer?**

Dyneon™ PFA, Dyneon™ FEP, Dyneon™ ETFE, Dyneon™ THV, and Dyneon™ HTE. For information on specific product features and applications, please see the appropriate technical data sheet on the web or consult with your Dyneon technical service representative.

[\(Return to Top of Page\)](#)**3. Are any Dyneon™ Fluorothermoplastic products FDA compliant?**

Yes, specific grades of Dyneon™ PFA, Dyneon™ FEP, and Dyneon™ THV can be used for repeated food contact use. For information on specific products, grades and available forms please see 'Dyneon Fluorothermoplastics Regulatory Compliance Status - Food Contact' or consult with your Dyneon technical service representative.

[\(Return to Top of Page\)](#)**4. Does Dyneon offer any Ultra High Purity (UHP) grades of fluorothermoplastics?**

Yes, an innovative line including Dyneon™ PFA UHP, Dyneon™ FEP UHP and Dyneon™ THV UHP, as well as Dyneon™ PFA-FLEX UHP is offered. These materials all possess very low levels of extractable impurities and are ideal for the semiconductor industry. Please contact your sales representative for further information on these materials.

[\(Return to Top of Page\)](#)**5. What forms are Dyneon™ Fluorothermoplastics available in?**

Our fluorothermoplastic materials are available in pellet, powder, and water-based dispersions.

[\(Return to Top of Page\)](#)**6. Which fluorothermoplastic has the highest temperature and chemical resistance?**

Dyneon™ PFA is fully fluorinated, melt processable, and has the highest chemical resistance of our fluorothermoplastics. It also has the highest service temperature rating, 260°C.

[\(Return to Top of Page\)](#)**7. Do any of the Dyneon™ Fluorothermoplastics meet the UL 94 specifications?**

Yes. Several members of the Dyneon™ PFA, FEP, ETFE and THV families have a rating of V-0 for UL 94 Vertical Burn.

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8. What is the most flexible grade of Dyneon™ THV?

Dyneon™ THV 220 is our most flexible fluorothermoplastic. The flexural modulus at 23°C is 80 MPa (ASTM D790, injection-molded bars).

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9. Why are fluoropolymers used as a barrier in automotive fuel systems to reduce automotive fuel evaporation emissions?

Fluoropolymers are known for their inherent chemical and temperature resistance. This property, along with their excellent barrier properties, makes them an ideal choice over hydrocarbon polymers. This is especially true for harsh automotive fuel applications where performance and durability are important. The relatively high specific gravity (around 2 compared to around 1 for hydrocarbon polymers) partially accounts for their good barrier properties.

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10. What is THV and how is it different from other fluoropolymers?

THV is an exclusive fluoropolymer from Dyneon that offers unique, high performance properties, which differentiate this material from the other commonly available fluorothermoplastics. The THV family of fluorothermoplastics is based on monomers of tetrafluoroethylene, hexafluoropropylene and vinylidene fluoride. Dyneon™ THV is unique because it has exceptional flexibility, can be co-processed with hydrocarbon polymers, has good permeation performance, can be bonded to a variety of other polymers, has excellent optical properties and excellent resistance to burning.

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11. Can THV be bonded directly to other plastics or elastomers or is an adhesive required?

Proprietary tie layers have been developed to bond to polyamides and polyolefins. Direct bonding to substrates such as polyamides and elastomers such as NBR, ECO, and FKM can also be achieved.

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12. Is corrosion protection required when extruding fluorothermoplastics?

Corrosion protected equipment is necessary for processing fluoroplastics such as ETFE, HTE and perfluoroplastics such as PFA and FEP. The THV 200 – 600 series plastics, process at relatively low temperatures compared to other fluoroplastics and may not require the same level of corrosion resistant equipment as that used with higher melting fluoroplastics. However, it should be remembered that THV is a

fluoroplastic and should be treated accordingly. Corrosion protection is recommended for processing THV X 815.

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13. Do fluorothermoplastic resins need to be dried prior to processing?

Fluorothermoplastics are hydrophobic, and generally do not require drying before processing unless high humidity conditions create surface moisture adsorption. However, electrostatic dissipative grades can absorb atmospheric moisture and should be dried to below 150 ppm moisture. Typically, a desiccant dryer with dew point less than 85°F set at 160°F for 4 hours is sufficient.

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14. What are typical melting temperatures for Dyneon Fluorothermoplastics?

Product	°C	°F
THV 220	120	250
THV 500	165	330
THV X 610	185	365
THV X 815	230	445
ETFE	260	500
FEP	260	500
PFA	310	590

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Elastomer FAQs

Dyneon™ Elastomers

1. **Does Dyneon sell rubber parts?**
2. **What is the difference between fluoroelastomers and other types of elastomers such as nitrile or silicone?**
3. **Does Dyneon sell fluoroelastomers that meet the SAE AMS specifications?/a>**
4. **How do I know when to use a high fluorine content fluoroelastomer?**
5. **When should I consider Dyneon™ Base Resistant Elastomers?**
6. **What is the difference between an incorporated cure fluoroelastomer and raw gum?**
7. **What is the difference between FE and FC grade Dyneon™ Fluoroelastomers?**
8. **Does Dyneon sell compounds?**
9. **Does Dyneon sell masterbatch curatives?**
10. **Does Dyneon sell fluoroelastomer coating systems?**
11. **What is the durometer (hardness) range of fluoroelastomer compounds?**
12. **What is the temperature range of fluoroelastomers?**
13. **What is the shrinkage rate for fluoroelastomers?**
14. **Can Dyneon™ Fluoroelastomers be bonded to other elastomers?**
15. **How long is a typical post cure?**

1. **Does Dyneon sell rubber parts?**



No, Dyneon is a fluoropolymer (resin) supplier. We manufacture fluoroelastomer gums in a variety of molecular weights, which are available with or without specialty curatives.

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2. What is the difference between fluoroelastomers and other types of elastomers such as nitrile or silicone?

The primary difference is that fluoroelastomers offer better chemical resistance to a broader range of chemicals. They also provide better long-term heat resistance. If your application has an operating temperature between 150° C (302° F) and 230° C (446° F), you should consider a fluoroelastomer. For specific chemical resistance information, please see [Dyneon™ Fluoroelastomers Chemical Resistance](#).

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3. Does Dyneon sell fluoroelastomers that meet the SAE AMS specifications?

Yes, please see our [Aerospace Industry Update](#) regarding technical specifications approved for fluoroelastomer o-rings, compression seals, molded parts and sheet goods.

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4. How do I know when to use a high fluorine content fluoroelastomer?

Generally, the higher the fluorine content of a fluoroelastomer, the better the chemical resistance and fuel permeation resistance.

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5. When should I consider Dyneon™ Base Resistant Elastomers?

Dyneon™ Base Resistant Elastomers (BREs) offer superior base resistance (as the name suggests). Consider using Dyneon BREs when your application calls for exposure to a basic environment such as engine lubes, transmission fluid, etc. For more information on choosing the right Dyneon product for your application, see our [Fluid & Heat Resistance Guide for BREs](#).

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6. What is the difference between an incorporated cure fluoroelastomer and raw gum?

A "raw gum" is the base polymer alone without the curative package. Incorporated cure fluoroelastomers are base polymers that include (i.e. you don't have to add) the curative package.

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7. What is the difference between FE and FC grade Dyneon™

Fluoroelastomers?

The proprietary cure system found in Dyneon™ FE grades provides improved scorch safety over our FC grades, allowing for higher molding temperatures and faster cure cycles. It is recommended that FE grades be used whenever possible for the cleanest running, most efficient molding processes.

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8. Does Dyneon sell compounds?

No, we sell fluoroelastomers, which are the base polymers that go into a fluoroelastomer compound.

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9. Does Dyneon sell masterbatch curatives?

Yes, we sell a selection of curative masterbatches. Please contact Dyneon for more information.

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10. Does Dyneon sell fluoroelastomer coating systems?

Yes, we have several latex (aqueous) grades available for coating applications. Additionally, Dyneon™ Fluoroelastomers can be dissolved by a variety of ketones resulting in a solution with up to 30% solids for coating applications.

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11. What is the durometer (hardness) range of fluoroelastomer compounds?

The durometer range is 45 to 90 for standard dipolymers and terpolymers.

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12. What is the temperature range of fluoroelastomers?

Fluoroelastomers (FKMs) can generally be used in environments ranging from -40° C (-40° F) to 225° C (437° F).

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13. What is the shrinkage rate for fluoroelastomers?

By shrinkage we are referring to the volume loss after cure. This rate varies from polymer to polymer but is roughly between 1.5 and 3%. Please contact Dyneon for specific shrinkage information.

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14. Can Dyneon™ Fluoroelastomers be bonded to other elastomers?

Yes, Dyneon has developed expertise in bonding fluoroelastomers not only to other elastomers but also to a variety of metals and plastics. Please contact Dyneon for specific bonding information.

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15. How long is a typical post cure?

Post cure ranges from 8 to 16 hours at 200° C (392° F) to 250° C (482° F) are typical; however, this can be optimized depending on what physical properties are required. Please contact Dyneon for specific post cure information.

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